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Air of Uncertainty: Can We Study Pollution and COVID-19 in the Midst of a Pandemic?

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Multiple recent studies have looked at whether air pollution increases the risk of developing or dying from COVID-19.[1,2,3,4,5,6] Ambient air pollution is known or suspected to cause or worsen conditions associated with SARS-CoV-2 infection,[7] including cardiorespiratory disease, respiratory disease, obesity, and type 2 diabetes.[8,9,10,11] So it is plausible that air pollution exposures could also be risk factors for not only SARS-CoV-2 infection but also worse disease severity and heightened mortality risk. However, a recent commentary in *Environmental Health Perspectives* warns that multiple studies on the topic—some of them not yet peer reviewed before being picked up by the media—are so flawed as to be invalid.[12]

The Canadian authors—Paul Villeneuve, an epidemiologist in the School of Mathematics and Statistics at Carleton University, and Mark Goldberg, an epidemiologist in the Department of Medicine at McGill University—have studied air pollution epidemiology for two decades. Concerned over media coverage of potentially incorrect findings, they searched both the peer-reviewed and non–peer-reviewed literature for studies of air pollution and either COVID-19 or the SARS outbreak in 2003. Of 53 papers, the authors identified 6 COVID-19 studies—4 of them not published in peer-reviewed journals at the time the commentary was written—and 3 SARS studies that were relevant to the hypothesis that air pollution can increase the risk of catching these diseases or worsen their prognosis.

Studies often used region- or county-level data. Yet counties vary from one another in social distancing, mask-wearing regulations, stay-at-home orders, and their position on the pandemic curve, as well in terms of air pollution. This, the authors say, makes analysis too broad to be meaningful.

"For a number of reasons, individuals are more vulnerable to catching and dying from COVID-19 in poorer neighborhoods," explains Villeneuve. "Ecological studies of air pollution can't control for all of these factors because they don't have individual-level data," he adds. "When they show an association between air pollution and COVID-19 mortality, they may simply be capturing these vulnerabilities from lower socioeconomic status."

The Navajo Nation is one of the U.S. populations hit hardest by COVID-19. As of 23 November 2020, the Navajo had 631 deaths and approximately 9,715 cases per 100,000 people living on the reservation,[13] compared with 3,722 cases per 100,000 people for the United States overall.[14] The Navajo also experience unusually high exposures to air pollution both indoors (e.g., from wood-burning stoves) and outdoors (e.g., from two coal-fired power plants on the reservation).[15] Image: © iStockphoto/grandriver.

"At this point, there is so much uncertainty in the risk estimates that have been reported in studies of air pollution and COVID-19 that they are unable to provide any insight as to whether ambient air pollution may increase the risk of dying from COVID-19," Villeneuve says. The authors conclude that such studies should not take place until after the pandemic ends to ensure accurate methodology, analysis, and conclusions. "We feel strongly that there is no public benefit to conducting these analyses in the middle of an active pandemic," they wrote.[9]

Not everyone agrees with that conclusion. "COVID-19 is a new challenge, and the data are inaccurate and imprecise," says Francesca Dominici, a professor of biostatistics at the Harvard T.H. Chan School of Public Health and senior author of one of the papers analyzed.[6] "In my humble opinion, we need to do the best we can to protect public health and protect the most vulnerable at the time of a pandemic"—especially since, as the *EHP* authors point out, it may take years to tabulate corrected data on COVID-19 deaths.

"Are these studies affected by severe limitations that cannot be overcome for many years? Unfortunately, yes," Dominici adds. "Are these studies valuable to pave the way for future research on this topic? Yes." She points out that the commentary lists well-known limitations that most of the authors are aware of but cannot do anything about.

Dick Heederik, a professor of health risk analysis at Utrecht University, says it is important that a critical review like this one has been published. "I hope it triggers the discussion that is needed on this topic," he says. "Some of the authors . . . did not have any serious track record in epidemiology or respiratory epidemiology," he says. "As a result, major but often very basic methodological issues were present in these studies in addition to the pandemic curve issue."

That said, Heederik thinks such studies can continue during the pandemic "as long as issues related to infection dynamics are accounted for in these studies." But, he adds, "some of the papers cited have major limitations that were not addressed by the authors [of the original studies]."

Villeneuve and Goldberg are concerned that media attention on the flawed studies draws attention away from the known higher risks for certain individuals and the fact that COVID-19 spreads among people in close contact. This, they wrote, "deflects from the increased rates of infection and health consequences caused by problems of social and income disparities, overcrowding, and other societal issues."[9]

Wendee Nicole is an award-winning writer living in Houston. She has written for *Environmental Health Perspectives*, as well as other publications, for many years.

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